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Expanding the National Naval Medical Center's Patient
Appointment Call Center: An Analysis

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Abstract

The new TRICARE contracts will shift the burden of providing outpatient appointing services from the contractors to Military Treatment Facilities (MTF). Through the Patient Appointment Call Center (PACC), the MTFs at Bethesda and Annapolis are ready for this transition while MTFs at Patuxent River and Quantico are researching potential solutions, including collaborating with PACC. The call center has the infrastructure and capacity to absorb additional appointing volume from these two clinics. Consolidating appointing services at this site is also the most cost effective alternative. In reviewing the merits of consolidation, however, Patuxent River and Quantico have to weigh the action's potential drawbacks particularly the loss of direct control over appointment scheduling and its implications on quality of service.

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Introduction

Overview of the National Naval Medical Center

The National Naval Medical Center (NNMC or Bethesda), also known as the "President's Hospital," is located in Bethesda, Maryland, inside the Washington, DC beltway. It is one of the largest MTFs in the U.S. Navy, with approximately 4,000 staff members (active-duty, civilians, and contractors). In Fiscal Year (FY) 2003, Bethesda saw 594,066 outpatient visits, admitted 9,631 patients, and accounted for over 42,735 bed days. The medical center is approved for resident training in medical and surgical specialties by many American physician specialty boards and by the Council on Medical Education and Hospitals of the American Medical Association. Many of the Graduate Medical Education programs at Bethesda are part of the National Capital Consortium and the Uniformed Services University of the Health Sciences that provide multi-site educational and clinical training opportunities at Bethesda, Walter Reed Army Medical Center (WRAMC), and Malcolm Grow USAF Medical Center. Bethesda is part of region one in the TRICARE (military health plan) network of 13 regions that subdivide the Military Health System (MHS) in the United States and abroad.

Conditions that prompted the study

The current generation of managed care support contracts (MCSC) for region one provide for a central appointing service

through Sierra Military Health Systems (SMHS or Sierra) in Baltimore, MD (Regional Appointing Officer Council, 2003). Until a few years ago, Sierra provided the bulk of outpatient appointment services for Bethesda and other Navy medical facilities in the region. However, dissatisfaction with the level of service provided by Sierra's call center prompted Bethesda to establish its own call center and take back most of its outpatient appointing services. By establishing its own centralized Patient Appointment Call Center (PACC) in June 2002, the NNMCC commander was able to exercise more direct control and authority over appointments booked for the medical center. This decision followed an earlier one by WRAMC to open its own call center to service not only Walter Reed, but also other Army medical treatment facilities in the region. Sierra still books outpatient appointments for Bethesda and WRAMC, but the bulk of its scheduling functions have shifted to patient appointments to the network, which are primarily specialty care appointments referred to civilian providers (Regional Appointing Officer Council, 2003).

Through a Memorandum of Understanding between Bethesda and Naval Medical Clinic Annapolis, Maryland (NMCLA or Annapolis), the call center has taken on outpatient scheduling functions for this clinic. As with Bethesda, however, referrals to the network are still primarily handled by Sierra. More recently,

Naval Medical Clinic Quantico, Virginia (NMCLQ or Quantico) and Naval Medical Clinic Patuxent River, Maryland (NMCLPR or Patuxent River) have expressed interest in partnering with PACC for their appointing services. Although these facilities have efficiently booked large portions of their clinics' appointments in the past and anticipate the same capability in the future, the prospect of them taking over all outpatient appointments, as called for in the next generation of TRICARE contracts scheduled to take effect in September 2004, prompted them to inquire about the feasibility of a partnership with PACC.

To determine the viability and costs of such a partnership, the Business Decision Support Department was commissioned to study the issue. Cost, workload and capacity analyses for PACC are called for in the study as well as appointing workload and capacity analyses for Patuxent River and Quantico. An analysis of the network appointing workload for Bethesda and the affected clinics is also important since this function is almost exclusively handled by Sierra, and will be turned over to the call center and the clinics when the new contract takes effect.

Statement of the Problem

Demand for appointments, supply of appointments, and the optimal use of the medium to connect these two competing requirements form the core of this study. In particular this study will answer the following questions: With its current

set-up, what is the call center capacity and will this be sufficient to absorb Quantico and Patuxent River's appointing functions and future additional requirements such as booking appointments to the network? If appointing system upgrades are necessary to meet increased demand, will the cost of taking up Quantico and Patuxent River's appointing functions offset the cost of the two clinics' maintaining or setting up their own dedicated appointing departments?

Purpose

This paper will assess the financial and functional impact on the call center of absorbing outpatient appointing services from the naval clinics in Patuxent River and Quantico. It will design demand and capacity models to determine if the call center needs to be upgraded to accommodate additional demand for appointment scheduling. It will also look at financial metrics to quantify the costs involved in the upgrade as well as the costs involved if the clinics were to set-up or maintain their own appointing services. A detailed analysis of this information will assist policy makers in deciding on the best alternative to address Patuxent River and Quantico's appointment scheduling needs.

Literature Review

Improving access to care for eligible TRICARE beneficiaries is the underlying goal behind this study. Access to care is

defined as the ability to obtain needed, convenient, affordable, and effective personal health services in a timely manner (Shi & Singh, 2001). In the MHS, access to care is summarized in the slogan "the right patient, to the right provider at the right time, at the right place." Critical to meeting this access standard is managing patient access through efficient appointing mechanisms (Regional Appointing Officer Council, 2003).

The efficiency of appointing systems correlates directly with timeliness of care, one of the Institute of Medicine's (IOM) six aims for improvement or six dimensions of quality where today's health care system underperforms (Institute of Medicine, 2001). These six dimensions of quality are also reflected in the MHS' definition of quality. Health Affairs Policy 02-016 defines quality in health care as "the degree to which healthcare services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Assistant Secretary of Defense for Health Affairs, 2002). This definition incorporates the IOM's six dimensions of quality that mandates safe, effective, patient centered, timely, efficient, and equitable healthcare service (Institute of Medicine, 2001). Efficient appointing systems not only address timeliness of care, but also influence the other dimensions of quality in healthcare.

Consistent with the goals of quality improvement in healthcare, senior leadership in the MHS crafted a set of performance measures that are aligned with the MHS' strategic priorities. Called measures for success, these performance measures are individual medical readiness, satisfaction with telephone access, and satisfaction with health plan (Assistant Secretary of Defense for Health Affairs, 2003). Satisfaction with telephone access is a measure that relates directly with the purposes of this study since all appointments handled by the call center, Sierra and a vast majority of appointments scheduled by the clinics are made via telephone. According to Dr. Winkenwerder, Assistant Secretary of Defense for Health Affairs (ASD/HA), telephone access is one of the leading indicators that affect overall perceptions of access. He argues that the MHS can alter overall satisfaction and improve efficiency of operations by focusing on access to care (2003). Scheduling an appointment is normally the first step in the health care delivery process and the patient's experience in this encounter is a significant factor in their overall assessment of care.

The MHS considers ease of making appointments by phone a key measure of access and has tracked this metric in the last few years through customer satisfaction surveys. The focus of these monthly satisfaction surveys is improving satisfaction

with access to appointments. These surveys are targeted towards those individuals who have chosen to enroll with the MHS (TRICARE Prime Enrollees) and are based on responses from individuals who had an outpatient medical visit at an MTF during the previous month. On a scale from "Poor" to "Excellent," the percentage of respondents that answer "Good," "Very Good," or "Excellent" (weighted by appropriate sampling weights) are computed. A comparison of the MHS' FY02 target rate for patient satisfaction with access to appointments with the actual satisfaction rate (84% versus 80.8% respectively) shows that the aggregate MHS score needs to be improved (Assistant Secretary of Defense for Health Affairs, 2003). With this study, it is hoped that not only the viability of taking over appointing functions for Quantico and Patuxent River will be assessed, but also that recommendations can be provided for a more efficient and optimized appointing system in order to pave the way for increased patient satisfaction.

In the MHS, there are three major types of appointing systems that potentially impact patient satisfaction. The first type is called the "saturated" or "full-triage" approach where patients who call in for same day appointments compete for slots. Those whose conditions meet the definition for acute care have higher priority than patients who do not meet the criteria. Consequently, schedules that are full for a month,

for example, become even more saturated as patients are repeatedly moved back on the priority list. As these patients are seen at a later time, patient backlog or "inventory" develops, starting a cycle that continually repeats itself (Myers, 2003).

Another type of appointment system, which is common in both civilian and military health settings, is called the "carve-out" approach. This model calls for predicting urgent demand and reserving time to meet it. Although carve-out models may function better than traditional, "full-triage" model, they too present their own problems. Since carve-out models typically reserve a supply of urgent care by designating a triage doctor for a given day, patients needing urgent care may see someone other than their primary care physician. This scenario threatens continuity of care and creates artificial demand for extra visits with the patient's personal physician. Furthermore, triage decisions are often wrong since the noisy and persistent, but otherwise non-urgent patient may get the urgent slot while the calm, uncomplaining and truly sick patient may not (Murray & Berwick, 2003).

The third, less common, appointment system approach is the open or advanced access system. This model leaves appointment slots deliberately vacant for daily access on demand so that patients calling to see their physicians are offered an

appointment the same day (Forjuoh, Averitt, Cauthen, Couchman, Symm & Mitchell, 2001). Instead of sorting demand into two queues, routine and urgent, the rule in open access appointing is to perform today's work today. Also, instead of sorting demand by clinical urgency, it sorts appointment demand by clinician and the central question for allocating appointments is whether the patient's personal physician is available to take an appointment on the day that it is requested (Murray & Berwick, 2003). If the personal physician is not available, the patient must be given the choice of seeing another physician or waiting to schedule an appointment with his or her primary care physician at a later date.

Of the three appointment system approaches described, open access is the most patient friendly, but it is also the most complicated and difficult to implement. To make this model work, patient volume and the required staffing patterns must be accurately predicted (Forjuoh et al., 2001). In other words, demand for appointments must be consistently met with the right supply of providers and support staff. The MHS leadership recognized the many advantages and benefits of this revolutionary appointing strategy while acknowledging the difficulties involved in implementing such a strategy. To this end, the MHS developed a guide for MTFs that are considering implementing an open access appointing system (Assistant

Secretary of Defense for Health Affairs, 2002). Regardless of the methodology selected, the underlying goals of any appointing system are the same--to meet access standards and improve customer satisfaction.

Similar to the trend within the MHS to consolidate parallel services and establish centers of excellence, partnership agreements between organizations are encouraged by the Navy's Bureau of Medicine and Surgery (BUMED) to maximize economies of scale in making operational and purchase decisions. Although these initiatives are first and foremost cost saving measures, they are also strategies to assist the MHS in improving efficiency, thereby increasing patient access and enhancing patient satisfaction. These are precisely some of the end goals behind Bethesda's decision to assist Annapolis with its appointing needs. They are also key considerations in Bethesda's evaluation whether to accommodate or abstain from absorbing Patuxent River and Quantico's appointing services.

In order to make an informed decision regarding either maintaining the status quo or expanding PACC's customer base, the center's current capacity and projected demand must be analyzed. Typical expansion projects that require investment outlays are judged based on return on investment. The most common consideration, and the one that usually carries the most weight, is financial return on investment calculated in terms of

profitability measures such as savings to investment ratio, payout period, or net present value (Gapenski, 2001). However, since this project does not rely on profitability measures to justify implementation, non-financial returns such as meeting access standards and improving patient satisfaction are equally, if not more, important. These non-financial goals address strategic and cultural benefits for the organization (Ginter, Swayne & Duncan, 2002). Improving access by expanding the call center could reinforce patients' beliefs that Bethesda and the clinics are looking for ways to serve them better, which in turn could bring a cascade of positive effects such as better patient-provider relationships, higher quality, and improved satisfaction.

In analyzing the costs of expanding the call center, only additional variable costs (e.g., phone bill less fixed charges), additional labor, and infrastructure upgrades will be considered. Fixed costs (e.g., contract labor, facilities, equipment, and existing telephone lines) will not be included in the calculation since these expenses will continue to be incurred whether or not this expansion project is implemented (Finkler, 1999). The costs associated with additional variable expenses, labor, and infrastructure upgrades will be weighed against the costs the clinics would incur if they were to allocate clerks and equipment dedicated to scheduling patient

appointments. A cost to benefit analysis would then be a useful comparison of the competing alternatives (Schmidt, 2002).

The decision whether to pursue or not to pursue the call center expansion cannot be solely based on its implications to Bethesda's bottom line. In fact, it would be difficult to trace direct financial benefits from such an expansion. Rather, the deciding factor has to be whether pushing ahead with the expansion makes financial sense from an MHS perspective. This outlook is in keeping with the Assistant Secretary of Defense for Health Affairs' vision for the MHS to fulfill its promise as a truly integrated system of interrelated and interdependent components designed to achieve some common goals, and where investment decisions are increasingly evaluated at the department or system-wide level rather than simply at the local or treatment facility level. Furthermore, integrating common functions such as appointment scheduling results in reduced operating costs by achieving economies of scale (Jacobs & Rapoport, 2002). In the MHS, the advantages of this strategy have been repeatedly demonstrated in the logistics arena where standardized and coordinated purchasing decisions by regional groups have saved millions of dollars.

The efficiency of work and potential cost savings from this likely consolidation project are important steps in the MTFs' continuing efforts to improve access to care. They address the

ASD/HA policy directive that makes access to care for beneficiaries a top priority of the MHS (Assistant Secretary of Defense for Health Affairs, 2002). Above all, they reflect the MHS' commitment to carry out its mission of treating the right patient with the right provider at the right time and at the right place.

Methods and Procedures

The first step in the data gathering phase was to determine historical demand using prior fiscal year data (i.e., the total number of appointments made by the call center, clinics, WRAMC, Sierra, and TRICARE on-line). Appointment data for Annapolis, Patuxent River, and Quantico were obtained from CHCS II, a medical and dental clinical information system that generates and maintains a comprehensive computer-based record for each MHS beneficiary (CITPO, 2004). Data for Bethesda were pulled from the call center database, which uses a software product licensed from Aspect Communications, Inc., manufacturer of the Automatic Call Distribution system and other equipment used at the call center.

Using available data, future demand per month was forecasted using a moving average. This technique exclusively employed historical observation and no attempt was made to model or understand the underlying causal relationships between variables. Although useful in forecasting aggregate monthly

demand and in determining if overall monthly demand can be met, a detailed breakdown of the number of calls per day and every 30 minutes was also needed to obtain a better picture of variations in demand. A careful analysis of this information was crucial in order to avoid Sierra's mistakes. The company met the standard for average monthly performance, but due to daily and hourly variations in demand, which it failed to forecast, many customers could not get through during peak times. Furthermore, insufficient agents resulted in long wait times and high rates of abandoned calls.

Since one of the purposes of this study was to determine if supply (appointment scheduling) can meet the new demand of additional calls for outpatient appointments from Patuxent River and Quantico, the next step was to calculate the call center capacity. This was accomplished by tallying the number of outpatient appointments and other calls handled by the call center and determining the weighted average time to complete each transaction. Dividing the total available work hours for all the appointment clerks per month by the weighted average time required for each transaction produced the monthly call center capacity (i.e., total available minutes for scheduling appointments). Varying productivity levels among the appointment clerks were factored in the calculation by averaging the call handling time of all clerks.

Following an analysis of the call demand and the call center's ability to handle this demand, labor adjustments, telephone infrastructure upgrades, and additional phone charges, were calculated. The call center is currently staffed by one supervisor, one assistant supervisor, and 23 appointment clerks, which is the optimum number of operators the existing telephone lines can accommodate. Therefore, any additional appointment clerks exceed the relevant range of the telephone infrastructure and would necessitate upgrades to the infrastructure itself in the form of additional T1 (dedicated phone connection that consists of 24 individual channels) lines. This additional unit cost effects a change in total fixed costs and is categorized as marginal or incremental cost (Finkler, 1999). Since marginal cost plays a crucial role in any business decision, this information will assist Bethesda's leaders in their decision regarding the proposed call center expansion.

Costs associated with setting up appointing systems in Patuxent River and Quantico were calculated and compared with the additional variable and incremental costs associated with expanding the call center. The result of this comparison determined which of the two alternatives was more cost effective from an overall or MHS standpoint.

Reliability and Validity

Collectively, data obtained from the MHS is assumed to be reliable and valid. Pursuant to a directive from the Assistant Secretary of Defense for Health Affairs (1999), the MHS instituted measures to improve data quality in its many source data systems such as the Composite Health Care System (CHCS), Medical Expense and Performance Reporting System (MEPRS), and Standard Personnel Management System (SPMS). At the MTF level, Data Quality Management Control (DQMC) Programs were instituted to assist Commanding Officers with the timeliness, completeness and accuracy of data submitted from their facility. The facility Data Quality (DQ) manager, with assistance from the Data Quality Assurance Team, is responsible for accomplishing these activities and presenting the results to the facility Commander who, in turn, signs a monthly "Data Quality Statement" (MHS Data Quality Management Control Review List, 2001). Despite these aggressive interventions to improve data quality, 100% accuracy of records cannot be guaranteed due to the sheer number and complexity of data entry points at Bethesda and the other clinics. On the aggregate, however, data obtained from MHS data repositories are generally accepted to be reliable and valid, and, therefore, suitable for this study.

Limitations of the Study

Due to difficulties in retrieving October, November and December FY-03 statistics from the call center database, only data from January through September FY-03 were pulled for the study. Missing data were forecasted and substituted using a nine-month moving average. Additionally, Quantico and Patuxent River do not have databases linked to systems such as Automatic Call Distribution or Voice Over IP that would enable them to track call volume. Consequently, call volume was projected based on the number of appointments, which were then adjusted using the proportion of Bethesda and Annapolis' scheduled appointments in comparison with call volume. These factors and other assumptions in the study must be taken into account when evaluating the study's conclusions and recommendations.

Expected findings and utility of results

This project will produce the call center's capacity and forecasted demand. From this information, it can be determined whether appointing services for Patuxent River and Quantico can be absorbed by the call center utilizing its existing infrastructure or whether investment upgrades are needed to meet the additional demand. If upgrades are necessary, variable and marginal cost data will provide policy makers with the information they need to decide whether it is more cost effective to expand the call center or whether it makes more

sense to establish separate appointing services for Patuxent River and Quantico. Even if the call center is not expanded, the capacity model can be used to optimize appointment scheduling given that the center is currently underutilized, booking less than 30% of Bethesda's outpatient visits. Additionally, the demand model, which can project daily demand in 30-minute increments, can assist call center supervisors with staff scheduling.

Appointment Breakdown

For appointing purposes, outpatient appointments can be grouped into two general categories: appointments that can be booked by the call center and those that cannot be booked by the call center. Appointments that fall under the latter category are reserved, using detail codes in CHCS II that restrict appointment clerk access, for booking by the clinics and/or providers only. Examples of these are appointments that have dollar signs by their classification types (ACUT\$, PCM\$, ROUT\$) and those specifically designated as provider book only (PBO). Additional restrictions are spelled out in the current business rules that detail appointing responsibilities. Other restrictions are by agreement between the call center and the clinics. These are manifested in the appointment templates generated by the clinics and used by the call center to book appointments.

Appendices (A), (B), (C), and (D) show the number and type of appointments for Bethesda, Annapolis, Patuxent River, and Quantico respectively. Appendix (A) also provides a detailed listing of the number of appointments booked for Bethesda by entities other than the call center. While Bethesda and Annapolis rely mostly on the call center, their clinics, and Sierra to book their appointments, Patuxent River and Quantico can only rely on their clinics and Sierra to book the vast majority of their appointments. Besides Sierra, the four sites also share a common appointing platform in TRICARE Online, a Department of Defense Internet portal that was designed to meet beneficiary needs for greater access and convenience in scheduling appointments. Despite its accessibility, however, the number of appointments made through TRICARE Online is very small relative to the other appointing platforms. These appointments will be excluded from the study.

Impact of New Managed Care Support Contract

The new Managed Care Support Contract for Region One, which will now become part of TRICARE North, will take effect on September 1, 2004. Unlike the previous contract, the new contractor will not be responsible for appointing services. Upon transition to the new contract, MTFs will solely be responsible for their appointing services.

For Bethesda, this transition will have minimal impact on patient appointing. The call center was opened almost two years ago and has been fully functional ever since. The vast majority of Bethesda's outpatient appointments are handled by the call center and the clinics within the hospital. Furthermore, the current contractor made, on average, 2.1% of Bethesda's appointments per month in FY-03 (Appendix A), numbers that can be easily handled by the call center.

Because Annapolis began partnering with the call center in 2003, transition to the new TRICARE contract will also have minimal impact on its appointing service. Annapolis already carries out the majority of its appointment scheduling, and only relies on the call center for approximately 25% of its appointing needs (Appendices A and B). Early partnership with the call center, perhaps in anticipation of changes to the managed care support contract, was not only prescient, but also an astute management decision. Furthermore, by outsourcing only a fraction of its appointments, Annapolis maintains control over its appointment books.

Appointments at Quantico are handled differently. Quantico utilizes front desk clerks to make acute appointments (conditions that require appointments within 24 hours) and clinic booked appointments (appointment types with dollar signs); all other appointments are booked by Sierra. Number and

type of appointments are listed in Appendix (D). This list shows that since Quantico relies on Sierra for approximately 35% of its appointment scheduling, it will be significantly impacted by the new TRICARE contract. They would either have to expand their current in-house appointing service or contract/collaborate with a third party.

Branch Medical Clinic Patuxent River is in a similar situation as Quantico. Although they serve a smaller population, the percentage of appointments that the clinic currently manages compared with that of Sierra leaves a huge workload that Patuxent River would have to absorb once the contract goes away (Appendix C). As with Quantico, they would either have to expand their appointing capacity or look outside for assistance.

Results

Demand and Capacity Data

To determine demand for the call center, overall call volume including all incoming and outgoing calls were considered. Incoming calls include calls to make or cancel appointments and calls routed to Sierra, Health Benefits Advisor (HBA), or Triage Nurse. Once calls are routed, they are considered outgoing calls. Regardless of their status, all were included in the demand calculation because each call ties up one or two of the 48 lines available to the call center. For

Table 1

Call Volume for NNMC and NMCLA

	Forecasted			Actual			
	OCT	NOV	DEC	JAN	FEB	MAR	APRIL
Handled by agents	21,335	21,241	21,493	22,181	18,972	22,019	21,085
Outgoing	7,219	6,819	6,985	10,820	5,330	6,436	6,892
Total	28,554	28,060	28,478	33,001	24,302	28,455	27,977
Transfer to Sierra	255	530	503	397	777	588	531
Transfer to Nurse	166	338	322	303	481	393	315
Transfer to HBA	52	123	126	81	99	152	136

	Actual						
	MAY	JUNE	JULY	AUG	SEPT	AVE	AVG Times
Handled by agents	21,197	21,904	22,529	20,613	21,511	21,340	4 min
Outgoing	8,618	7,830	7,286	5,940	5,823	7,167	3.45 min
Total	29,815	29,734	29,815	26,553	27,334	28,506	
Transfer to Sierra	611	451	465	454	639	547	
Transfer to Nurse	380	347	324	280	355	353	
Transfer to HBA	131	126	176	104	130	127	

example, an incoming call continues to tie up a line even after it is transferred and converted to outgoing, where it ties up another line for a total of two lines tied up by a single call. Both lines are opened only after the call is terminated. Overall call volume or demand for Bethesda and Annapolis is listed in Table 1.

Adding Bethesda and Annapolis' demand to those of Patuxent River and Quantico produces overall call center demand. However, since the two latter clinics do not tally their call volumes, made appointments will be substituted instead. Additionally, since call volume is significantly higher than the

Table 2

Revised Call Volumes for NNMC, NMCLA, NMCLPR, and NMCLQ

NNMC & NMCLA	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Call Volume	28,554	28,060	28,477	33,001	24,302	28,455	27,977
Scheduled Appts	9,380	7,728	9,558	10,791	9,136	9,758	10,834
Appts / Volume	32.9%	27.5%	33.6%	32.7%	37.6%	34.3%	38.7%
Patuxent River Scheduled Appts less ACUT appts	5,255	4,029	4,057	4,473	4,798	4,796	4,877
Adjusted Volume	15,997	14,629	12,087	13,679	12,763	13,985	12,594
Quantico Scheduled Appts less ACUT appts	5,015	3,408	3,461	4,541	3,723	4,405	4,528
Adjusted Volume	15,266	12,374	10,312	13,887	9,903	12,845	11,693
Overall Volume	59,817	55,063	50,876	60,568	46,968	55,286	52,264

NNMC & NMCLA	May	Jun	Jul	Aug	Sep	Ave
Call Volume	29,815	29,734	29,815	26,553	27,334	28,506
Scheduled Appts	10,169	9,902	10,169	8,747	9,589	
Appts / Volume	34.1%	33.3%	34.1%	32.9%	35.1%	
Patuxent River Scheduled Appts less ACUT appts	4,109	4,014	3,376	3,477	3,477	4,228
Adjusted Volume	12,047	12,053	9,898	10,555	9,911	14,937
Quantico Scheduled Appts less ACUT appts	4,565	5,119	5,558	4,720	5,322	4,530
Adjusted Volume	13,384	15,371	16,296	14,328	15,171	13,403
Overall Volume	55,247	57,159	56,009	51,436	52,416	54,426

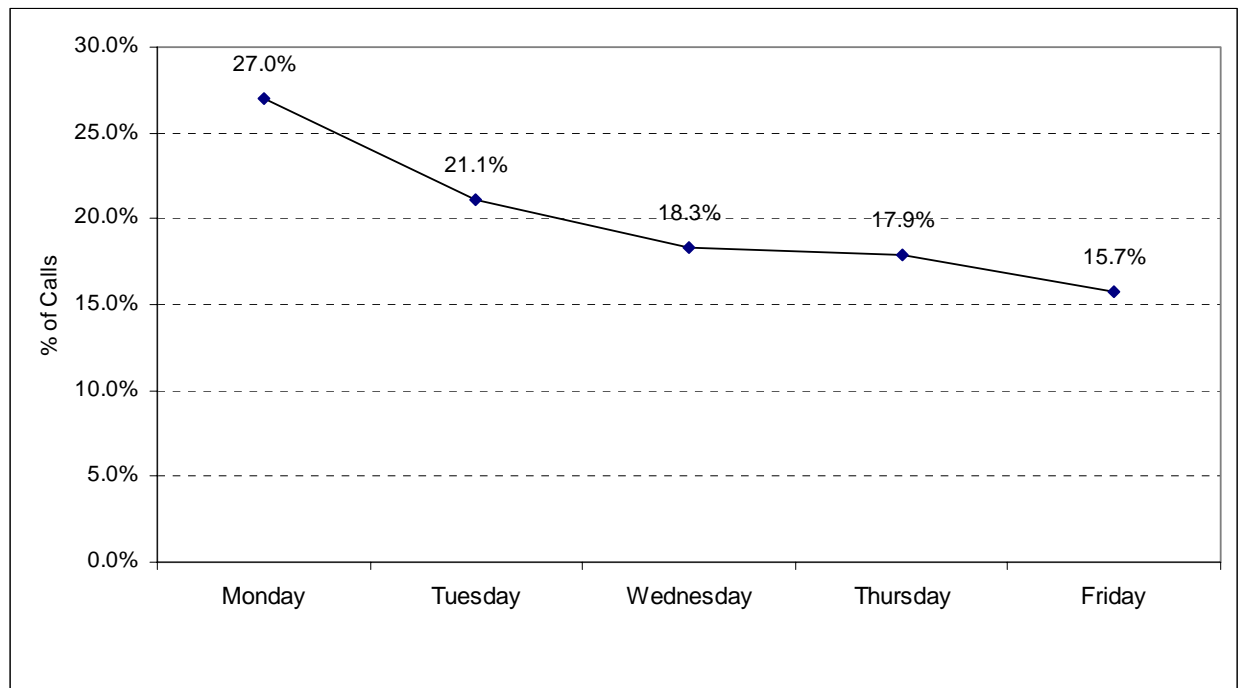
number of made appointments, demand will be adjusted based on the proportion of scheduled appointments to call volume. In the case of Bethesda and Annapolis, made appointments are, on average, only 34% of call volume. This proportion will be

applied to Patuxent River and Quantico's made appointments in order to come up with a substitute call volume. Revised call volumes are contained in Table 2.

As seen in Table 2, when Patuxent River and Quantico are included, average call volume for the call center almost doubled from 28,506 to 54,426 calls. The table also shows that for every made appointment, approximately two other calls may be generated. These additional calls could be anything from calls to cancel appointments, transfers to HBAs or triage nurses, or just general inquiries. Although these calls may not result in actual appointments, they still tie-up phone lines and should be made part of the demand equation.

Using overall monthly demand, daily and 30-minute call volumes can be calculated. Statistics retrieved from the call center database (Table 1) show that January had the highest monthly call volume. From this, daily and 30-minute call distribution charts were generated (See Figures 1 and 2). Only weeks with five workdays were used in the daily call distribution tally. Short workweeks, i.e., those with holidays within the week, do not follow this distribution. They typically show a spike in call volume the day after the holiday, regardless of what day the holiday falls on. Volume on these days is comparable to those on Mondays, and on some occasions even exceeds them. Normal call distributions, however, follow a

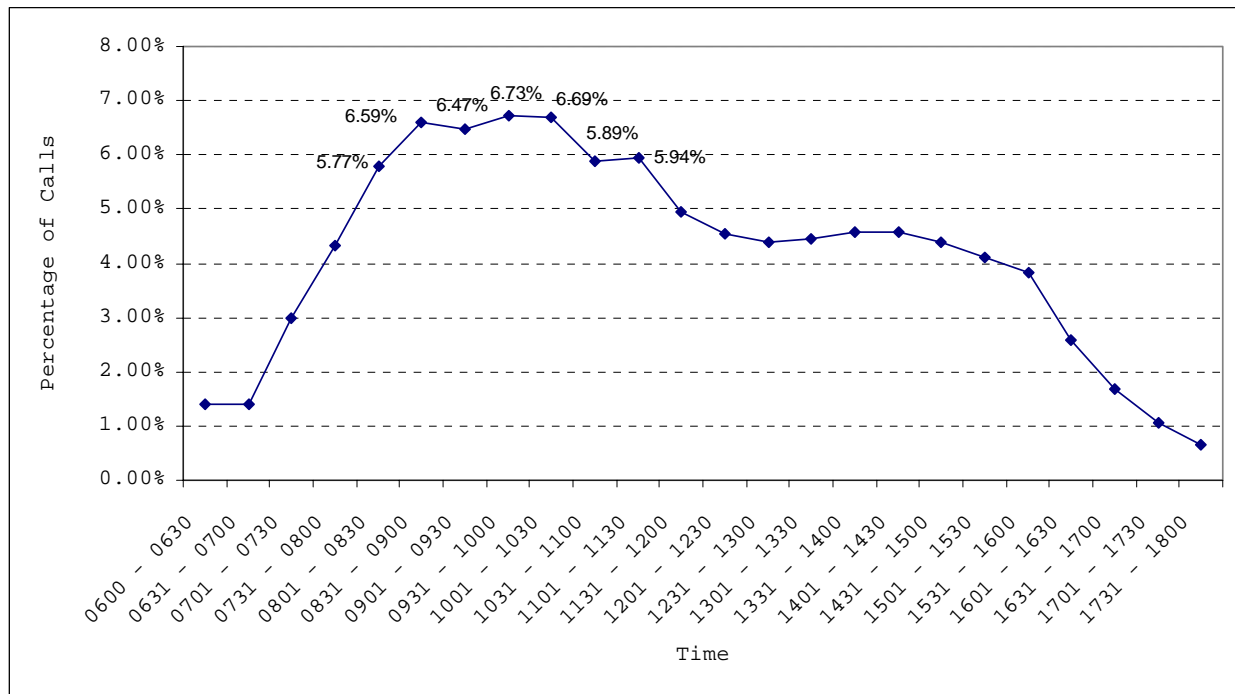
Figure 1. Daily Call Distribution



pattern where calls are highest the beginning of the week and then gradually taper off to their lowest volume at the end of the week. Figure 2 shows an hourly call distribution where volume slowly builds up until it peaks between 0930 and 1030 and then gradually tapers off.

Having broken down demand by months, days, and 30-minute increments, only the highest volume from each group will be used in determining capacity. Put another way, capacity will be measured by the highest volume of calls that the call center can handle within each of these parameters. If the call center can handle the highest monthly, daily and 30-minute call volumes, it follows that it can handle other call volumes the rest of the time. The revised demand data using the highest call volumes

Figure 2. Hourly Call Distribution



are presented in Table 3.

With demand information in hand, the next task is to determine if the call center's capacity can accommodate this demand. To determine capacity, call center work hours, number of appointment clerks, number of phone lines, and average duration of calls are computed. The number of phone lines is especially critical because this determines whether or not a call gets through to the call center. The call center currently uses two T1 lines, which means that at any given time, and with no transferred calls still active, 48 calls can get through. Of these calls, the number of appointment clerks limits to 23 the number of calls that can be handled by agents. The rest remain in the system either passing through the call options menu,

Table 3

Highest Call Volumes

Monthly	60,568
Weekly (split evenly for 4 weeks)	15,142
Daily (27% of weekly calls)	4,088
Every 30 min (6.73% of daily calls)	275

tying up a line while in a transferred status, or otherwise waiting in the queue for the next available operator.

Capacity is reached when one of two measures are met: first, when a caller gets a busy signal and, second, when a caller has to abandon a call or wait for an extended period of time because an agent is not readily available. In FY-03, wait times (elapsed time after a patient selects the option to speak with a clerk and the time they get connected) averaged 43 seconds.

With the first measure, Table 4 shows that capacity is reached when 356 calls are in the system (i.e., being processed by agents, in the call queue, transferred but active, etc.) in any 30-minute interval. When call number 357 tries to access the system, a busy signal is returned. According to LT Russell Braden, PACC Department Head, the only time this scenario materialized was in January 5, 2004, when for 18 seconds at 0900 and 25 seconds at 1200, all lines at the call center were busy.

Table 4

T-1 Line Capacity

Telephone Lines	48
Minutes Available per Day (720 min. per line)	34560
Minutes Available per 30 minutes	1440
Average Duration of Call	4:03
Capacity every 30 minutes	356

One weakness of the preceding capacity calculation is that it assumes that calls are spread out within a 30-minute period and that calls roll out as others roll in. As mentioned earlier, however, calls may come in bunches and may stay in the system in bunches, potentially overwhelming the phone lines. For example, an extremely high number of calls may come in simultaneously, flood the system and result in busy signals for any incoming calls. But, since this possibility cannot be reliably predicted (i.e., how many simultaneous calls will come in over a certain period of time plus how many calls are still in the system during the same time period) without doing a simulation analysis, it is not factored in the capacity calculation.

Capacity is reached in the second measure when 170 calls are handled by agents in any 30-minute interval (Table 5). Like the busy signal measure, this capacity figure represents an

Table 5

Agent Capacity

Agents	23
Minutes Available per Day	16560
Minutes Available per 30 minutes	690
Average Duration of Call	4:03
Capacity every 30 minutes	170

average; it can go up or down depending on the duration of calls. Also, like the busy signal measure, and for the same reason explained above, it does not account for the possibility of an extremely high number of simultaneous calls that could instantly use up agent capacity. This scenario, however, is more the exception rather than the rule. Data shows that calls requiring agent assistance are more likely to be spread out over 30 minutes rather than tightly bunched up in five or ten minute packets.

Staffing and Cost Data

The call center is staffed by agents contracted through Kelly Services, Inc. The yearly contract provides for 23 appointment clerks, one assistant manager, and one manager. This fiscal year's contract was purchased for \$1,175,143, the largest component of the call center's annual budget. Each additional clerk costs \$43,282. Additional T1 lines through

Table 6

Telephone Charges for Toll Free Calls

	Current	Expanded	
	NNMC & NMCLA	Patuxent River	Quantico
Ave. Calls Per Month	3,995	14,937	13,403
Ave. Call Length	4:12	4:12	4:12
Total Call Length	16,313	61,607	55,280
Cost per Minute	\$0.028	\$0.028	\$0.028
Monthly Cost	\$456.76	\$1,725.00	\$1,547.84
Yearly cost	\$5,481.17	\$20,699.95	\$18,574.08
Total Cost	\$5,481.17	\$39,274.03	

Verizon, Inc., costs \$853.00 per line plus the cost of outgoing calls, currently \$0.03 per call. Equipment upgrades to support an additional T1 line and installation costs are available from Aspect Communications, Inc., for \$3,956. Charge for toll free calls is \$0.028 per minute. All other costs are fixed and not relevant to the study.

The most obvious cost increase associated with expanding the call center is increase in telephone charges, both local and toll free. However, due to distance (Patuxent River and Quantico are 77 miles and 46 miles away from Bethesda respectively) patients would most likely use the toll free number instead of the local number to call PACC. For this reason, all calls from these sites will be computed as toll-free calls, which entail higher telephone charges. Current and expanded toll-free telephone charges are provided in Table 6.

Discussion

Some of the estimated costs incurred in building and maintaining Bethesda's call center (Appendix E) are useful in projecting some of the likely costs of building and maintaining a call center for Patuxent River or Quantico. Appendix E shows that the cost of a call distribution system's licensing, support and telephone line fees alone significantly exceed the cost of consolidating appointing services at the call center. If two or even one call center were built for these clinics, these recurring charges would cost approximately \$52,600 (excluding cost of calls), compared to approximately \$39,300, which is the additional telephone cost for PACC. Staffing and miscellaneous expenses for the new call center simply add to the overhead costs that already exceed the costs of an expanded PACC. Investment outlays to build a new call center could easily run in the hundreds of thousands of dollars, further weakening the viability of this option.

Although the cost comparison favors consolidation over building a new call center, loss of control over their appointing services could be an issue for Patuxent River and Quantico as it was for Bethesda when Sierra handled a large share of its appointments. Direct action on the part of the clinics to resolve simple appointing issues will be lost and they would have to rely on the call center to handle these

issues for them. Additionally, despite the best of intentions, delay in the resolution of any issue is inevitable because of the fact that an additional layer in the organization is added to the appointing process.

Patuxent River and Quantico stand to loose control of quality of service if they outsource this service to PACC. Quality of service measures comes in the form of acceptable wait times or simply the absence of busy signals. A legitimate concern for these clinics is whether the call center can truly handle the additional volume without sacrificing quality. As was previously identified, the call center has already experienced maximum capacity, albeit only one day, with its current call volume. The capacity model only projects maximum call volume every 30 minutes, which will meet projected demand if calls are spread out over this time span. It does not factor the possibility that calls may not arrive in a neat, evenly laid out sequence. To improve the likelihood that all calls, even when they are bunched up or more calls come in simultaneously, will get through to the call center, installation of another T1 line is recommended.

An additional T1 line might address the problem of calls not getting in the system, but not whether clerks can handle them once they get in. Again, the model projects that the current staffing numbers would be able to handle the workload.

However, there will be spikes in call volume that may or may not become more frequent with the increase in call volume brought on by consolidation. If the consolidation option is selected, it is recommended that calls be monitored for average wait times and abandonment rates so that if these measures exceed current levels the number of clerks and their schedules can be adjusted accordingly.

Conclusions and Recommendations

The models presented in this paper show that, on the whole, call center capacity can meet demand. This does not mean, however, that demand will be met 100% of the time. There may continue to be instances wherein the issues raised in the preceding section will be tested and demand projections exceeded. How often call volume might exceed capacity is beyond the scope of this paper.

What this paper can address is which alternative to pursue as Patuxent River and Quantico look for options to address future appointing needs. Based on the financial data presented, it is more cost effective to consolidate appointing services at PACC. The center currently has excess appointing capacity that would enable it to absorb the projected call volumes from Patuxent River and Quantico while still meeting its current needs.

To address spikes in call volumes and limit busy signals in the future, installation of an additional T1 line is recommended. This is a small investment with huge potential returns including few or no busy signals. Additionally, if the consolidation option is adopted, future studies to examine its impact on the ability of the call center to deliver timely and quality service as measured by acceptable wait times and busy signals are recommended. Adjustments to staff and line capacity could then be aligned with actual demand.

Appendix A

NNMC FY03 Outpatient Appointments

	Forecasted			Actual									
Call Volume	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave
Handled by agents	21335	21,241	21,493	22,181	18,972	22,019	21,085	21,197	21,904	22,529	20,613	21,511	21,340
Outgoing	7219	6,819	6,985	10,820	5,330	6,436	6,892	8,618	7,830	7,286	5,940	5,823	7,167
Total	28554	28060	28477	33,001	24,302	28,455	27,977	29,815	29,734	29,815	26,553	27,334	28,506
% Handled by Agents	74.72%	75.70%	75.47%	67.21%	78.07%	77.38%	75.37%	71.10%	73.67%	75.56%	77.63%	78.70%	75.05%
Appointing Volume													
NNMC	38,851	32,479	33,106	40,170	34,016	35,998	37,009	35,542	35,367	37,556	34,299	38,709	
% made by PACC	21.5%	21.3%	25.6%	24.1%	23.8%	24.2%	26.8%	26.5%	25.5%	24.7%	23.7%	22.9%	
PACC Workload for NNMC													
Appointments scheduled	8,370	6,930	8,477	9,691	8,100	8,708	9,917	9,433	9,001	9,281	8,133	8,852	
Appointments cancelled	1,292	1,171	1,467	1,595	1,549	1,528	1,589	1,538	1,463	1,501	1456	1,635	
Total	9,662	8,101	9,944	11,286	9,649	10,236	11,506	10,971	10,464	10,782	9,589	10,487	
PACC Workload for NMCLA													
Appointments scheduled	1,010	798	1,081	1,100	1,036	1,050	917	736	901	888	614	737	
Appointments cancelled	103	106	119	140	151	154	122	117	167	125	91	120	
Total	1,113	904	1,200	1,240	1,187	1,204	1,039	853	1,068	1,013	705	857	
NNMC & NMCLA													
Total Booked	9,380	7,728	9,558	10,791	9,136	9,758	10,834	10,169	9,902	10,169	8,747	9,589	
Total Cancelled	1,395	1,277	1,586	1,735	1,700	1,682	1,711	1,655	1,630	1,626	1,547	1,755	
Total Transactions	10,775	9,005	11,144	12,526	10,836	11,440	12,545	11,824	11,532	11,795	10,294	11,344	
Patuxent River													
Bookable Appts (less ACUT)	6,483	5,236	5,326	5,816	5,817	6,129	6,018	4,376	4,295	3,568	3,679	3,717	
Quantico													
Bookable Appts (less ACUT)	9,925	7,368	8,917	9,802	7,730	9,961	9,132	8,608	11,260	11,524	9,243	9,246	
Total Booked / Total Volume	32.85%	27.54%	33.56%	32.70%	37.59%	34.29%	38.72%	34.11%	33.30%	34.11%	32.94%	35.08%	33.90%

Appendix B

Naval Medical Clinic Annapolis FY-03 Outpatient Appointments

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave
ACUT	653	690	653	952	881	780	852	638	521	1997	597	358	
EST	123	122	43	121	152	161	217	87	71	111	118	168	
PROC						2	3	1	2		2		
ROUT	591	432	650	722	749	678	604	506	565	1985	1099	271	
SPEC	290	172	154	224	93	80	90	133	493	194	103	141	
WELL	23	31	84	108	102	106	96	76	109	212	375	81	
Total	1680	1447	1584	2127	1977	1807	1862	1441	1761	4499	2294	1019	23498
ACUT\$	2377	1565	868	1238	1157	1315	1331	1130	888	1621	2578	1864	
EST\$	2471	1404	963	1584	1360	1445	1623	945	625	1782	1356	1492	
GRP\$	65	62	62	111	46	79	79	87	77	82	52	72	
PCM\$	1												
PROC\$	30	57	28	55	40	57	65	36	30	34	46	33	
ROUT\$	2324	2054	1035	1304	1346	1389	1640	1460	1007	1437	984	1505	
SPEC\$	578	575	429	583	553	706	738	602	557	898	496	605	
WELL\$	550	276	830	1097	1363	1182	1240	709	1178	2784	1229	761	
Total	8396	5993	4215	5972	5865	6173	6716	4969	4362	8638	6741	6332	74372
Overall	10076	7440	5799	8099	7842	7980	8578	6410	6123	13137	9035	7351	97870

Appendix C

Naval Medical Clinic Patuxent River FY-03 Outpatient Appointments

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave
ACUT	1228	1207	1269	1343	1019	1333	1141	267	281	192	202	240	
EST	378	252	254	271	303	321	307	822	917	318	230	220	
GRP	68	50	32	30	32	34	51	72	56	56	121	54	
PCM	44	40	17	32	37	55	35	33	30	51	33	39	
PROC	342	236	181	114	170	89	178	89	125	94	68	138	
ROUT	3966	3044	3184	3517	3851	3908	3976	2682	2533	2495	2701	2540	
SPEC	456	395	389	509	405	389	330	410	353	251	246	201	
WELL	1	12						1		111	78	285	
Total	6483	5236	5326	5816	5817	6129	6018	4376	4295	3568	3679	3717	5038
ACUT\$	3		4		1	1	49	942	903	39	19	24	
EST\$	68	129	112	146	151	176	230	591	240	966	1030	1100	
GRP\$	31					3			39	30			
OPAC\$	50	247	142	242	235	343	419	365	364	922	1112	1125	
PCM\$						1	67	77	32	39	43	1	
PROC\$	13	23	22	23	28	46	46	24	19	29	13	17	
ROUT\$	139	142	168	216	335	290	161	227	186	158	162	196	
SPEC\$	238	140	155	114	186	228	204	245	275	263	307	275	
WELL\$	5							8	8	3	16	44	
Total	547	681	603	741	936	1088	1176	2479	2066	2449	2702	2782	1521
Overall	7030	5917	5929	6557	6753	7217	7194	6855	6361	6017	6381	6499	6559

Appendix D

Naval Medical Clinic Quantico FY-03 Outpatient Appointments

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave
ACUT	4910	3960	5456	5261	4007	5556	4604	4043	6141	5966	4523	3924	
EST	189	136	143	142	111	102	67	76	41	20	25	17	
PROC	4	17	9	32	4	16	15	26	44	24	19	8	
ROUT	2700	1663	1767	2295	1884	2314	2298	2272	2488	1960	1878	2381	
SPEC	687	480	516	551	461	587	687	537	453	508	459	557	
WELL	1435	1112	1026	1521	1263	1386	1461	1654	2093	3046	2339	2359	
Total	9925	7368	8917	9802	7730	9961	9132	8608	11260	11524	9243	9246	9393
ACUT\$	978	1163	954	1404	1621	1503	1644	1551	1290	1105	1234	1210	
EST\$	1100	854	878	1128	1025	1092	1079	999	1624	2231	1397	1583	
PROC\$	885	886	721	861	834	865	891	872	244	89	58	90	
ROUT\$	183	209	108	157	96	85	59	46	72	119	107	94	
SPEC\$	924	624	405	797	612	622	509	1206	1168	964	437	626	
WELL\$	764	689	794	901	787	1055	730	895	943	815	566	434	
Total	4834	4425	3860	5248	4975	5222	4912	5569	5341	5323	3799	4037	4795
Overall	14759	11793	12777	15050	12705	15183	14044	14177	16601	16847	13042	13283	14188

Appendix E

Patient Appointment Call Center Costs

Set Up Costs	Estimates
Bldg 141 Improvement	250,000
Furniture	57,901
Chairs	14,520
Supplies	4,182
Fax	283
LCD Projector	3,995
Aspect Phone System	173,250
Aspect 15 Additional Licenses	48,000
4 phone switches	10,000
PRI installation (T1 Lines)	500
Computers	50,650
Cabling	27,000
TAD / Training	3,000
Marketing	5,000
Total	648,281

Yearly Costs	Estimates
Salaries (23 contract employees)	\$1,175,143.36
Aspect license Support	32,000
ASCAP license renewal	191
T1 phone lines (\$853 per month for each line)*	20,472
Toll Free Number (\$50/month + \$0.28 per min)	6,000
Copier Lease	1,900
Supplies	8,000
Total	1,243,706

*(excludes \$0.03 charge per outbound call)

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